CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Automated Spatial Linkage

Deployment Examples

Craig Wolff, M.S. Eng
CA Environmental Health Tracking Program
Environmental Health Investigations Branch
CA Department of Health Services
Impact Assessment, Inc.

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Outline

1. Background/refresher
2. Architecture update
   a) Data model
   b) Object model
   c) Standards
3. Spatial Linkage examples
   a) Modeled air toxics linkage service
   b) Pesticide linkage service
   c) Traffic linkage service
4. Next steps

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Background

- Tracking Program Announcement: "… staged development of a standards-based EHPT network that allows direct electronic reporting and linkage within and across health effect, exposure, and …"

- SND Principle #2: "…Systematic linking will consist of standardized protocols, methodologies, and toolsets that are generic and flexible enough to account for varying linkage scenarios on datasets that are distributed across the Network.

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

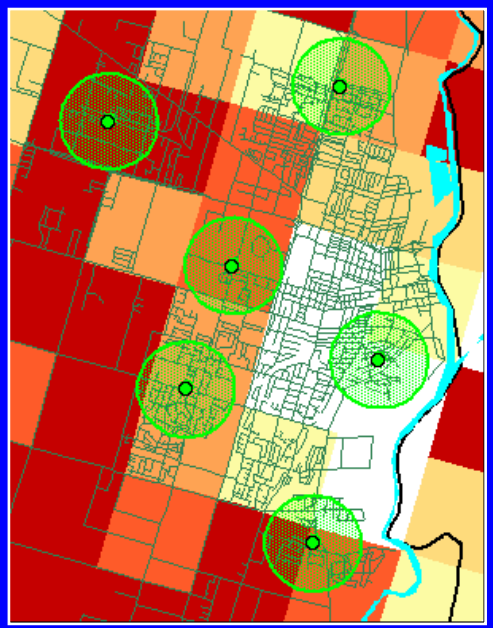
What is EH Spatial Linkage?

- The integration of environmental hazard and health data based on spatial relationships
- Spatial Linkage should extend PHIN- and NEIEN-compliant systems with dissemination component
- Spatial Linkage begins after geocoding and ends before traditional statistical analysis of epidemiological associations
- Automated for enterprise-level consumption

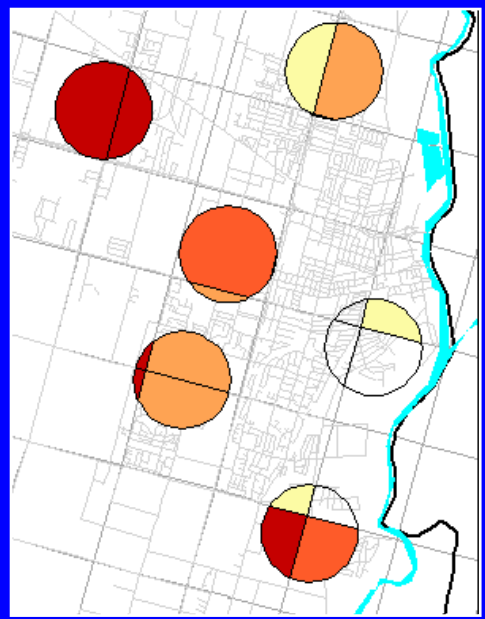
e.g. EH Spatial Linkage

Primary dataset: Point events
Secondary dataset: Area events

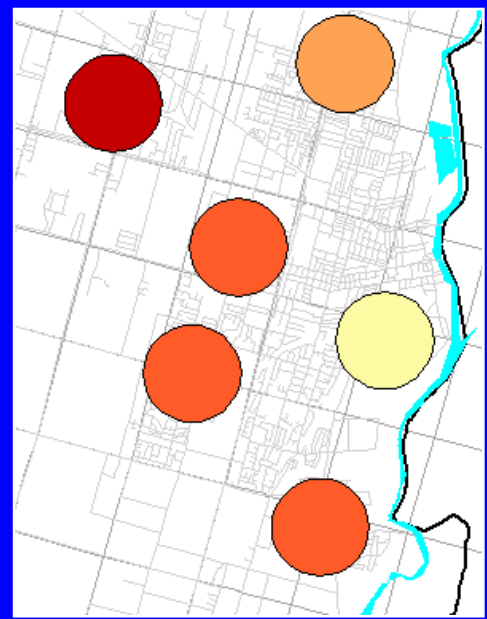
Buffer



Intersect



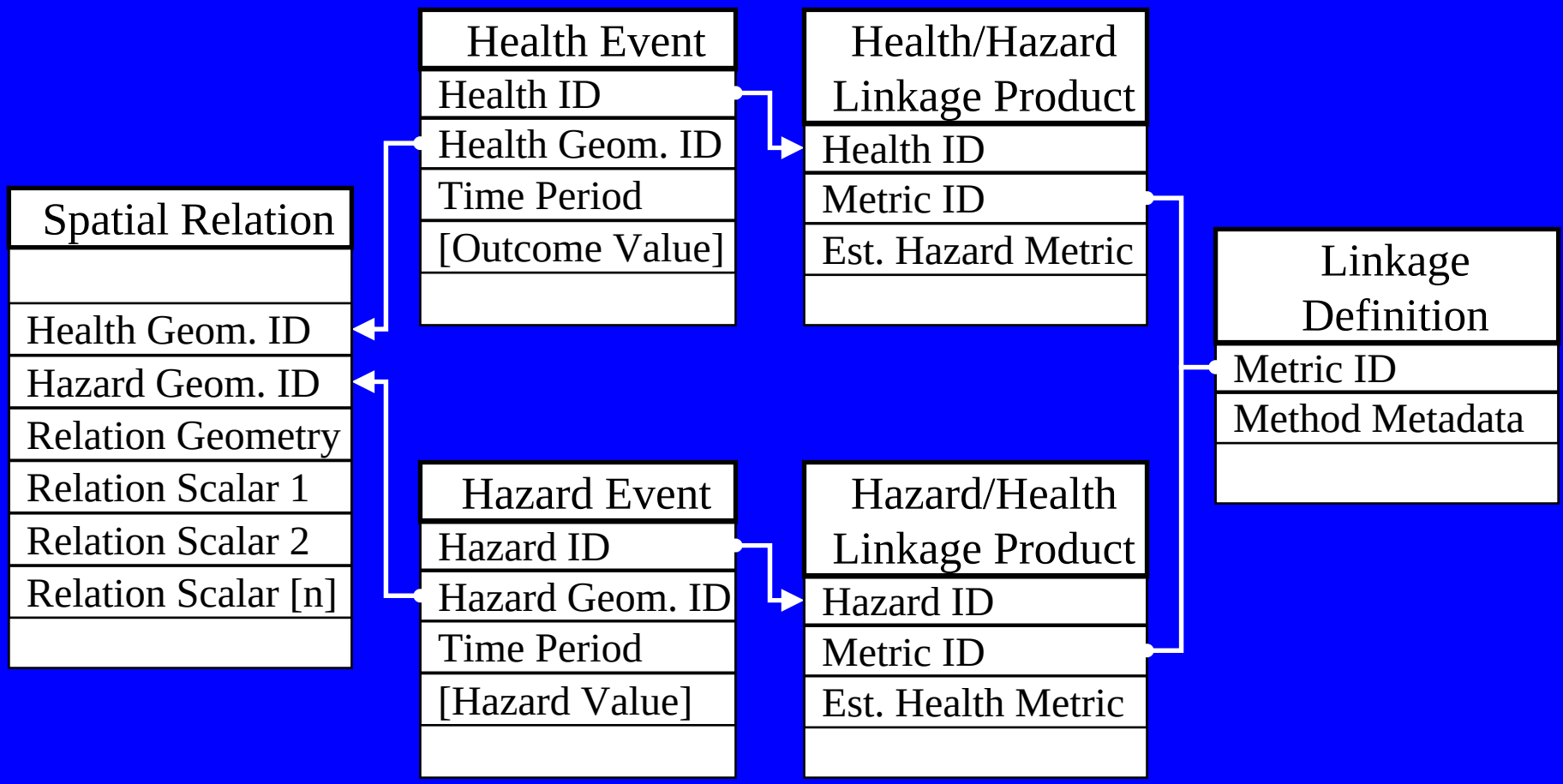
Summarize



e.g. Health-Centric Message Flow

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Spatial Linkage Data Model



Spatial Linkage Object Web MDL

SOAP Complex Types

Web Service Methods

LinkageDefinition
- MetricID

LinkageMetric
- MetricID
- MetricValue

LinkageTool
- SpatialRelation[]
- getCapabilities()
- setOptions()
- setPrimaryEvent()
- getMetrics()
- getRelations()

Future

SpatialRelation
- HealthGeometryID
- HazardGeometryID
- RelationGeometry
- RelationScalar[]

TransformFactory
- getSpatialRelations()
- intersectXWithY()

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Standards

- Existing
  - OGC Simple Features Geometry Model
  - OGC Web Processing Service (WPS)
  - OGC Geographic Markup Language (GML)
  - PHIN LDM (Health Event Definition)
  - NEIEN XML Schema (Hazard Event Definition)
- Still Need
  - Integrated Environmental Health Data Model
  - Spatial Linkage Web API Interface standard

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Air Toxics Linkage Service

- Partners: California Air Resources Board (ARB) and Vestra, Inc.
- Objective: Health-centric integration
- Data Source: Modeled ground level concentrations (GLC) of mobile and stationary sources from emissions and ambient monitoring inventories; analytes include smog precursors, and selected toxic air contaminants from the CA Air Toxics "Hot Spots" program

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Air Toxics Linkage Service, cont'd

- Details: ARB hosts service that accepts buffered health event and desired GLC metrics. Intersects buffer with polygon grid, summarizes and returns requested GLC metrics

- Progress: Beta service completed by end of May. South Coast modeling completed by mid-summer. Preliminary linkage runs by end of summer

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Pesticide Linkage Service

- Partners: California Department of Pesticide Regulation (DPR) and California Department of Water Resources (DWR)
- Objective: Health-centric integration
- Data Sources: DPR-reported agricultural pesticide use reports at Section ($1mi^2$) spatial resolution. DWR annual agricultural land-use surveys at field-level resolution

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Pesticide Linkage Service, cont'd

- Details:
  - CEHTP hosts service
  - Accepts buffered health event, time period of exposure, and desired pesticide chemical-specific or group codes
  - Intersects buffer with Section (or refined land-use geometry)
  - Summarizes and returns requested pesticide metrics in mass or mass/land area

- Progress: Data import/enhancement for PUR and land-use completed. Crosswalk between PUR and land-use crop codes completed. Beta service and preliminary linkage runs expected by late August

Pesticide Linkage Service, cont'd

- NEIEN Grant: DPR Exchange Network proposal includes electronic reporting and dissemination, spatial resolution enhancements at field-level, and spatial linkage services for integration with CEHTP.

Traffic Linkage Service

- Partner: California Department of Transportation (CalTrans)
- Objective: Health-centric integration
- Data Source: CalTrans Functionally Classified Layer (FUNC) conflated to GDT street centerlines in Alameda County. CalTrans Highway Performance Monitoring System Average Annual Daily Traffic in 2001.

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Traffic Linkage Service, cont'd

- Details: CEHTP hosts service that accepts buffered health event and desired traffic volume metrics (highest, nearest, sum, distance, direction). Intersects buffer with segment-specific volumes, summarizes and returns requested GLC metrics
- Progress: Beta service completed in February 2005 and available to registered users at www.ehib.org. Traffic metrics computed for birth outcome population, asthma population, blood-lead samples, and soil lead testing in Alameda County
- Demo

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Next Steps

- Refine vision and requirements
- Year 4 activities – additional services not covered by pilot projects, e.g. hazard-centric service with Vital Stats (birth outcomes) and Hospitalization data; metadata services
- Contractor completes analysis and implements abstract API components (future projects)

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

Discussion